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COVER: Thirty-two years after an extraordinary act of heroism in Vietnam, former hospital corpsman Robert Ingram received the Medal of Honor. Story on page 25. Photo by Rodney Freeman, *Jonesboro Sun,* Jonesboro, AR.

Hospital Corpsmen Conduct Research Side By Side With Navy Scientists

This year, the Navy Hospital Corps celebrates 100 years of service. Navy and Marine Corps personnel are continuously deployed in forward areas, showing the flag around the world, and with them are members of the Hospital Corps. Traditionally, corpsmen bring medicine to the deckplates providing medical care for their shipmates, rendering first aid, and caring for the sick with the competence and dedication that has earned them the respect of a grateful nation.

Hospital corpsmen also serve in another forward area, forward into the future—at the Navy's premiere biomedical research facilities located around the world. Corpsmen who demonstrate their unique skills and capabilities have an opportunity to work side by side with research scientists to develop new medical advances and treatments that will save the lives of Sailors and Marines and bring medicine to the deckplates of the 21st century.

Two such corpsmen are stationed at the Naval Medical Research Institute (NMRI), Bethesda, MD. HM2(FMF) Robert Kampen, a surgical technician with an interest in the science behind the surgery, works on a team making great strides in nonrelated organ transplant research. HM2 Sean Scanlon, a histocompatibility technician, uses Polymerase Chain Reaction technology to type bone marrow using DNA probes.

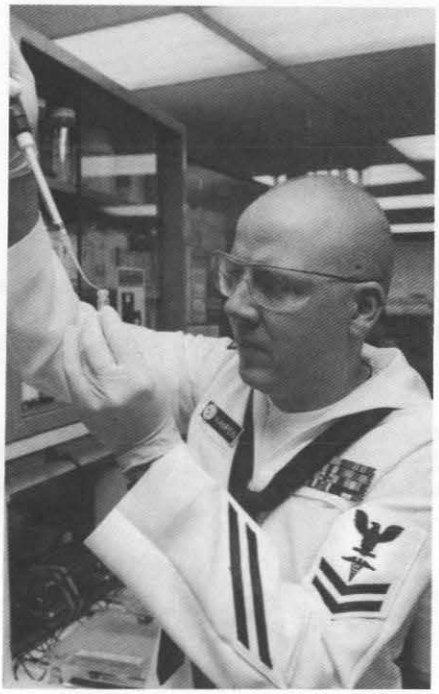
According to HMCM(SS/AW) Dominick Heyl, Command Master Chief at NMRI, "These two sailors are what our Hospital Corps is all about. They have displayed determination, flexibility, and a sustained drive to succeed. They took the basic fundamentals that Navy medicine taught them and carried that training into a new arena. It must be said that these two excellent Sailors have been fortunate to receive all of the benefits of successful mentorship. Their contributions to the Navy and the Naval Medical Research Institute are long lasting."

HM2 Kampen, a native of New Orleans, LA, has work for nearly a year as the senior laboratory technician in the Transplantation Biology Branch of the Immune Cell Biology Program at NMRI. The research team marked a significant milestone in 1997 in testing a novel medical therapy that seems to prevent rejection of mismatched transplanted organs in nonhuman primates. HM2 Kampen has had the opportunity to learn basic and advanced laboratory techniques and eventually to conduct an independent study regrading biopsies of organ tissue after transplantation and treatment with the new therapy.

HM2 Kampen describes what he does, "I work with tissue samples from our experimental animals, and through various chemical processes, I am able to extract the DNA and then view, on a molecular level, what is happening within the tissue after the treatment with this novel anti-rejection therapy."

In May 1998 HM2 Kampen presented the results of his research at the annual meeting of the American Society of Transplant Surgeons in Chicago, IL. "I was ecstatic that I had the opportunity to present at a major scien-

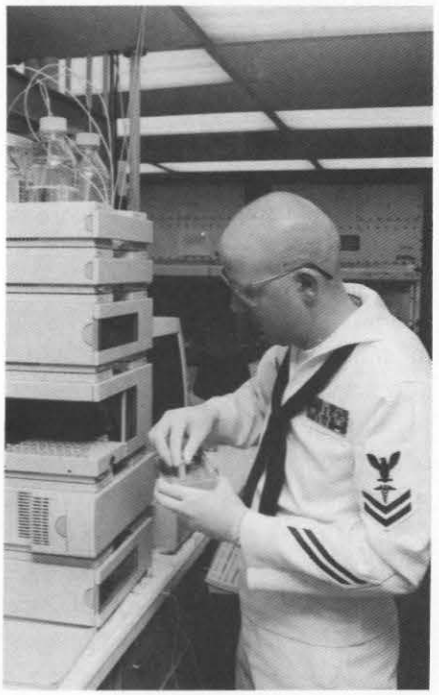
HM2 Kampen prepares a DNA sample for the High Performance Liquid Chromatography machine and . . .



tific meeting. The talk in Chicago went way beyond anything I have ever experienced. There were about 3,500 people in attendance. The day Dr. Kirk and I gave our talks, we were in a dark room filled with about 100 people who signed up to attend the session and listen to our presentations. I had the opportunity to meet many interesting people, many who were senior doctors in their field of research, who were interested in my abstract and what it meant. The work discussed during our session meshed well with the other data that was being presented at the conference. The data we presented gave a new twist to the standard paradigm of what happens on a cellular level in regard to an immune response to a foreign body, meaning organ transplantation."

HM2 Kampen spent 1 year at Louisiana State University as a music major prior to enlisting in the Navy. HM2 Kampen plans to attend the University of Maryland this fall, focusing on an undergraduate degree in science. "Building on my credits from LSU, and college credits earned with my Navy experience, I would like to complete my degree in molecular biology and eventually enroll in a graduate program for immunology. I want to be a scientist and I want to do this type of research. I want to cure the common cold!"

HM2 Kampen joined the Navy in 1987 when he decided that college was not where he wanted to be at that time. He didn't really know what he wanted to do so he headed for the fleet. He met a master chief, an independent duty corpsman, who pointed him in the right direction. HM2 Kampen said, "I always had an interest in science and medicine, but never knew how to express it, and the master chief said maybe becoming a corpsman would be a good career choice." Shortly after Hospital Corps "A" school in 1988, HM2 Kampen attended surgical technical school in San Diego, CA. He adds, "I went on from there to Field Medical Service School at Camp Pendleton, CA, before my first tour as a surgical tech at Naval Hospital Patuxent River, MD. I went overseas for almost 4 years to U.S. Naval Hospital Keflavic, Iceland, where I started out as a surgical tech and then finished the tour as a senior corpsman in the outpatient clinic. I took orders to NMRI to have spouse collocation." His wife, a corpsman, was transferred to the Naval Academy, Annapolis, MD.

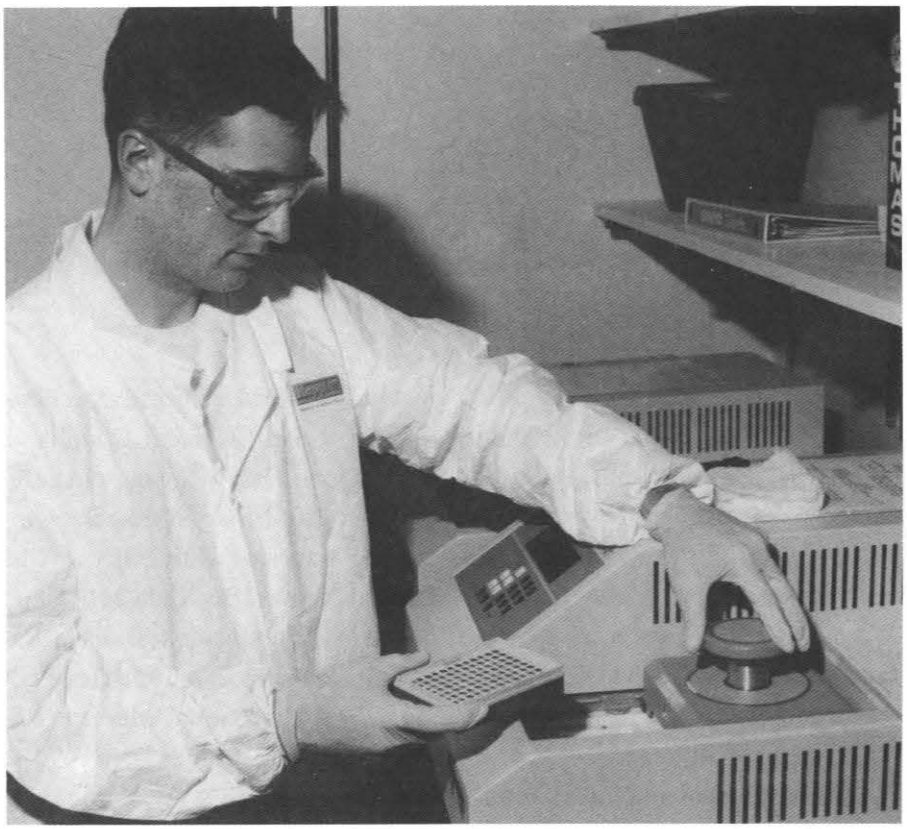


. . . loads a sample tray to be run on the machine. The machine will determine light absorption of the DNA.

HM2 Kampen adds, "Coming to NMRI was probably the best decision I ever made. I have been given the opportunity to work with some really outstanding people here, both military and civilian, and will always be grateful for their leadership and mentoring."

HM2 Sean Scanlon is a histocompatibility technician from Charlotte, NC. He works at the Bone Marrow Registry Department at NMRI. The primary focus of the department is to rapidly and accurately identify potential DOD donors, type their bone marrow, and add them to a national registry of available nonrelated bone marrow donors. Bone marrow transplantation is a method of treating bone marrow suppression caused by leukemia and other malignancies, radiation, or chemical injury.

HM2 Scanlon types bone marrow using state-of-the-art Polymerase Chain Reaction (PCR) technology. He says, "All my work is done at the molecular level, using advanced DNA techniques. I extract DNA from white blood cells, then use PCR, a duplication process that exponentially multiplies the DNA. This PCR process is an essential research tool because it can take a small amount of DNA and multiply it so it is



HM2 Scanlon uses Polymerase Chain Reaction technology to type bone marrow using DNA probes and . . .

large enough to study. After the DNA has been multiplied I use another specific process incorporating 33 different probes to create an identifiable pattern referred to as an HLA type, unique to a specific bone marrow type." According to HM2 Scanlon it is not unusual to type nearly 200 samples in a 5-day period. His laboratory has HLA typed over 110,000 potential DOD donors.

HM2 Scanlon originally planned to attend North Carolina State University and study engineering, but decided to join the Navy instead in 1992. "During the recruiting process I met a corpsman who outlined the advantages of the Hospital Corps. He pointed out that corpsmen were everywhere throughout the Navy, working with the Marines and doing research. So I decided on the Hospital Corps."

HM2 Scanlon went to boot camp in Great Lakes, IL, and then moved on to Advanced Laboratory Technician School in San Diego, CA. In 1994 he was stationed on board a ship overseas. "That was one of the most rewarding experiences of my career. I learned so much and I matured during that time, I began to focus on what I wanted to do with my life."

His first experience with research was on board the ship working with scientists from the Medical Research Unit in Jakarta, Indonesia, who were conducting an *E. coli* vaccine study. In 1996 he was assigned to NMRI. "The experience I had before coming to NMRI provided valuable insight as to the reasons why we are here at NMRI. The purpose of the research is to support the men and women who serve this country. We are here to keep them healthy." HM2 Scanlon will be making some major changes in his life in the next few months. He will be leaving the Navy, attending North Carolina State University to pursue a degree in computer engineering, and is getting married in August. ❑

—Story by Naval Medical Research and Development Command, Bethesda, MD. Photos by HM2 JaSon E. Wright and HM3 Joel Williams, NSHS, Bethesda, MD.

. . . works under the hood loading a 96-well sample plotter, part of the process to HLA type bone marrow samples.

Flag Officer Selections

RADM Cowan

RADM **Michael L. Cowan**, MC, Deputy Director for Medical Readiness, J-4, the Joint Staff, received his second star. He was born in Hays, KS, and raised in Fort Morgan, CO. After receiving his undergraduate education from the University of Colorado, he completed his M.D. degree at the Washington University of Medicine (St. Louis) in 1969.

A specialist in internal medicine and hematology, Dr. Cowan completed postgraduate training at the National Naval Medical Center, Bethesda, MD. He is board certified in internal medicine and medical management.

RADM Cowan has had a variety of assignments in his Navy career including Commander, Defense Medical Readiness Training Institute, Fort Sam Houston, TX; Commanding Officer, Naval Hospital, Camp Lejeune, NC; Task Force Surgeon, Operation Restore Hope, Somalia; Force Medical Officer Commander, Naval Surface Forces Pacific, NAB Coronado, San Diego, CA; Executive Officer, Naval Hospital Beaufort, SC; Special Assistant for the National Disaster Medical System, Office of the Assistant Secretary of Defense (Health Affairs), Washington, DC; Senior Research Fellow, National Defense University, Washington, DC; Medical Corps Career Plans Officer, Naval Medical Command, Washington, DC; Vice Chairman, Department of Military Medicine, Uniformed Services University of the Health Sciences, Bethesda, MD; Chief of Clinical Investigations Branch, Malaria Vaccine Research and Development Program, Naval Medical Research Institute, Bethesda, MD.

RADM Cowan's awards include the Defense Superior Service Medal, Legion of Merit (two awards), Defense Meritorious Service Medal (two awards), Meritorious Service Medal (two awards), Joint Service Commendation Medal, Navy Commendation Medal, U.S. Public Health Service Commendation Medal, and various service and campaign awards. He has also earned the Army Expert Field Medical Badge.

RADM-selectee **James A. Johnson**, MC, is currently Principal Director for Clinical and Program Policy in the Office of the Assistant Secretary of Defense (Health Affairs). Dr. Johnson was born in Wilmington, NC, and spent his formative years in Chicago, IL, and Washington, DC. Southern California has been his home since 1970. He earned his undergraduate degree in

biology/chemistry at Oberlin College, and his medical degree at the University of Rochester. He served both his internship and residency at the University of California at Los Angeles.

Dr. Johnson was commissioned in the Ensign 1915 program in 1966. Early assignments included serving as the senior medical officer aboard the amphibious assault ship USS *New Orleans* and as a general medical officer at Marine Corps Recruit Depot, San Diego, CA. During a subsequent assignment to Naval Hospital Camp Pendleton, CA, he held a progression of assignments: Staff Surgeon; Chairman, Department of Surgery; and, finally, Director of Surgical Services. He was next assigned to Naval Hospital San Diego as Assistant Chairman, Department of Surgery. In 1989 he was transferred to Washington, DC, where he held the position of Deputy Chief of the Medical Corps. Transferred back to San Diego in 1991, he was assigned as Medical Director at the Naval Hospital and was subsequently named Deputy Commander, a position he held until 1994. At that time, he assumed command of Fleet Hospital Six which deployed on a United Nations mission in Croatia. In October 1994 he became the Commanding Officer of Naval Hospital Bremerton, WA, where he served until 1997.

CAPT Johnson holds certificates from the American Board of Surgery and the American Board of Medical Management. He is an assistant clinical professor of surgery at the Uniformed Services University of the Health Sciences. He has been in private practice, has authored several important surgical papers, and has been a noted lecturer. He maintains affiliation with numerous civilian medical organizations, and is a Fellow of the American College of Surgeons and a member of the American Medical Association, National Medical Association, American College of Physician Executives, Association of Military Surgeons of the United States, and Society of Medical Consultants to the Armed Forces.

CAPT Johnson's awards include the Legion of Merit, Meritorious Service Medal, Navy Commendation Medal, Joint Meritorious Unit Citation, Navy Meritorious Unit Citation, National Defense Medal, Vietnam Service Medal, Armed Forces Service Medal, Humanitarian Service Medal, Philippine Presidential Unit Citation, United Nations Medal (Yugoslavia), NATO Medal, and the Vietnam Campaign Medal. ❑

CAPT Johnson

Strato-Lab High 5:
Triumph and Tragedy

On 4 May 1961, an aluminum cage, suspended beneath a 411-foot hydrogen-filled balloon, ascended from the deck of the aircraft carrier USS Antietam (CVS-36) *cruising in the Gulf of Mexico 138 miles southeast of New Orleans, LA. In less than 2 hours the two-man crew had reached the very edge of space.*

Strato-Lab High 5 *marked a series of firsts in high-altitude flight. The 10 million-cubic-foot balloon was the largest balloon ever used in manned flight. The ascent was the first ever made from the flight deck of an aircraft carrier, and the altitude attained was the highest made by man in an open gondola. However, in an instant, the triumph of that mission would turn to tragedy as one of the crewmembers drowned in a freak accident during recovery.*

Precursors

High-altitude balloon research was nothing new in 1961. In 1935 a flight sponsored jointly by the Army Air Corps and the National Geographic Society rose to a new altitude record of 72,395 feet, a record that remained unchallenged for two decades. At the time there was general consensus that this altitude would never be surpassed by balloon because rubber expands with altitude until it eventually fails. However, by the end of World War II, the Navy became interested in the use of plastics, which do not have the expansion characteristics of rubber.

The Office of Naval Research (ONR) made the first plans for upper atmosphere balloon research in 1946. Near-space physics, nuclear energy, cosmic radiation, and human physiology were the kinds of high-altitude data they sought.

The original project, *Helios*, was named for a Greek sun god. A contract with the University of Minnesota and General Mills, Inc. called for the construction of plastic balloons and a gondola equipped with a battery of scientific instruments. A sealed cabin was to be supported by 100 of the balloons at an anticipated altitude of 100,000 feet for 10 hours.

Dr. Jean Piccard and O.C. Winzen were among the principals in the project, working along with ONR's CDR George Hoover. Their concept was to use a thin plastic material which permitted a reduction in the weight of the balloon itself to only a fraction of that of a rubber balloon, thereby allowing the plastic cluster to reach a considerably higher altitude.

This ambitious plan was superseded in 1947 by *Project Skyhook*, which involved the use of polyethylene balloons carrying instrument packages to extreme altitudes. Thousands of these balloons were sent into the stratosphere for basic research.

In 1952 a new technique developed. Deacon rockets were lifted above 70,000 feet by Skyhook balloons. At a fixed altitude, a pressure switch would fire the Deacon from an almost vertical position. With the aerodynamic drag of lower altitudes thus eliminated, the rocket could achieve a near vacuum ballistic trajectory and attain heights greatly in excess of those reached by surface firings.

So successful were these flights, that in 1954 there were plans to entrust the lives of men to a thin film of polyethylene plastic. *Strato-Lab* came into being in 1955 as a practical, economical method of obtaining fundamental data in the fields of astronomy, astrophysics, and upper atmosphere physics. During the next 6 years, five *Strato-Lab* flights were made, four of which used gondolas originally constructed for the abortive *Helios* project.

Test equipment included cameras to photograph the formation, growth, and decay of contrails created by jet aircraft; special gamma telescopes for cosmic radiation study; and, most importantly, a wide variety of aeromedical experiments. CAPT Norman Lee Barr, MC, developed a telemetry method for recording in real time a pilot's physi-

ological reactions, heart reactions, and respiratory conditions.

The first *Strato-Lab* flight took place on 10 Aug 1956 manned by LCDR Malcolm D. Ross and LCDR M.L. Lewis, attaining a record altitude of 76,000 feet. The 125,000-cubic-foot balloon and fiberglass gondola launched from Minneapolis, MN, reached an altitude of 40,000 feet. Its goal was to photograph jet vapor contrails and gather other data. Constant physiological data on the pilots was telemetered to a chase plane. Special cold weather clothing protected the pilots in the -60° F. cold.

Other flights sponsored by the Office of Naval Research shortly began reaching ever higher with balloons designed to gather data in the upper atmosphere. One of the principal elements of this research was to evaluate the effects stratospheric flight had upon man.

What was unique about *Strato-Lab High 5* was the gondola. Previous balloon-manned balloon flights had encased their precious human cargoes in sealed spherical aluminum or fiberglass gondolas. *Strato-Lab High 5*'s gondola was an open aluminum cage. The only things pressurized would be the two spacesuits worn by the crew. This flight would provide the toughest test yet for a new generation of spacesuits—the Mercury-type Navy Mark IV full-pressure suit operating for the first time in a near-space environment.

Strato-Lab High 5 was truly a cooperative Navy effort sponsored by the Bureau of Medicine and Surgery, the Bureau of Naval Weapons, and the Office of Naval Research, with technical assistance of the Naval Air Crew Equipment Laboratory, the Aviation Medical Acceleration Laboratory, and the Naval Medical Research Institute.

The Crew

CDR Ross [USNR] was the pilot and LCDR Victor A. Prather, Jr., MC, the medical observer. Ross was a veteran of several balloon flights. It was Prather's first balloon flight.

The helium-filled balloon, a polyethylene plastic envelope a thousandth of an inch in thickness, supported the gondola, which itself hung from a large parachute, 70 feet in diameter. The chute was designed to open automatically to bring the gondola down if the balloon failed. The balloon, parachute, gondola, and the trailing antenna made the craft taller than an 80-story building. The balloon itself was needle-shaped at sea level, but took on the form of an onion at highest altitude with pressure a mere .09 pounds per square inch.

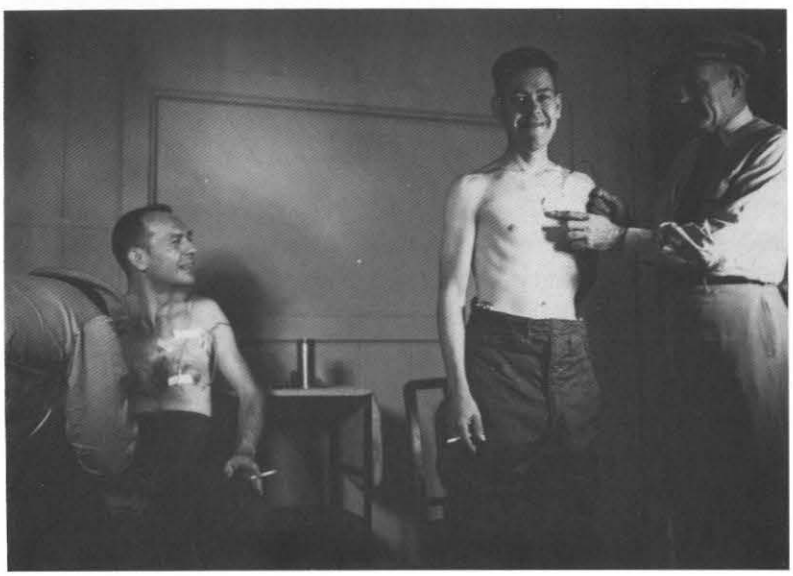
Winzen Research Inc., of Minneapolis, designed the craft, an open gondola with adjustable slats, black on one side, aluminized on the other so as to absorb or reflect the sun's heat as desired.

These slats functioned like venetian blinds to control temperature. To warm up, the aeronauts lowered the venetian blinds all around the gondola and turned the black side out so that they would absorb energy from the sun. To cool the gondola, they turned the blinds silver side out.

Before donning their pressure suits, technicians affixed sensors to Ross and Prather. Collodion and rubber cement held the electrodes firmly in place. Such physiological data as EEGs, EKGs, rectal temperature, face and face-plate temperature, axillary (armpit), thigh, left-foot and left-hand temperatures would be telemetered to the ship. Two transmitters, one for each man, were to transmit signals on such functions as respiration, pulse rate, heart beat, and temperature which were relayed to six separate telemetry receivers, three for each man, located on land, sea, and in the air. This system provided protection against the malfunctioning of any individual receiver. These data were automatically recorded and transmitted directly to monitoring personnel both aboard the carrier and in tracking aircraft.

The medical monitors were Navy physician CAPT Carl Pruett and Dr.

Office of Naval Research photos



Pilots LCDR M.D. Ross (left) and LCDR M.L. Lewis have the electrodes of the electrocardiograph affixed prior to their first manned flight of *Strato-Lab* on 10 Aug 1956.

Naval Medical Research Institute

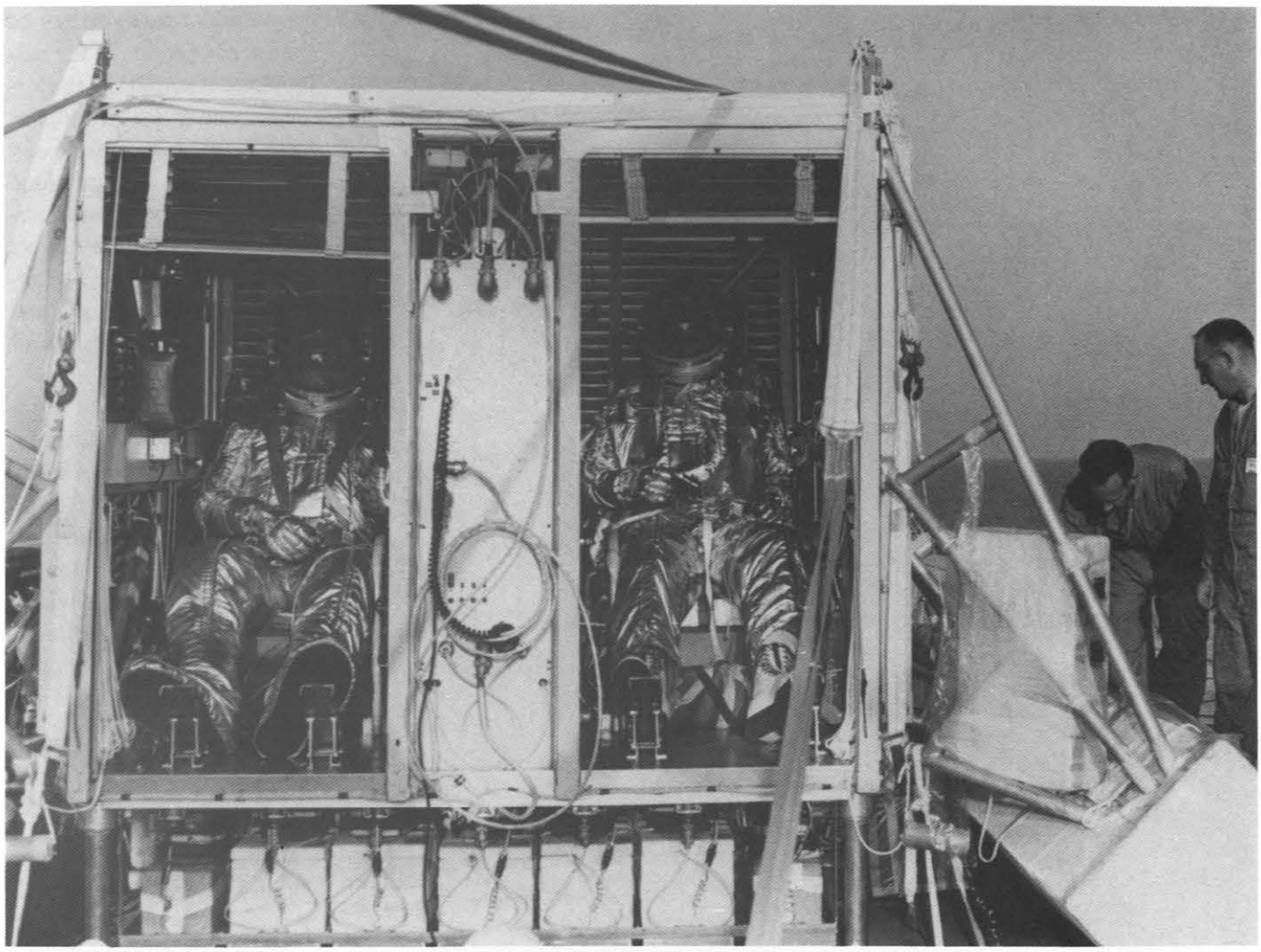
LCDR Victor A. Prather, MC, *above,* and *at right,* suits up before flight of *Strato-Lab High 5* on 4 May 1961.

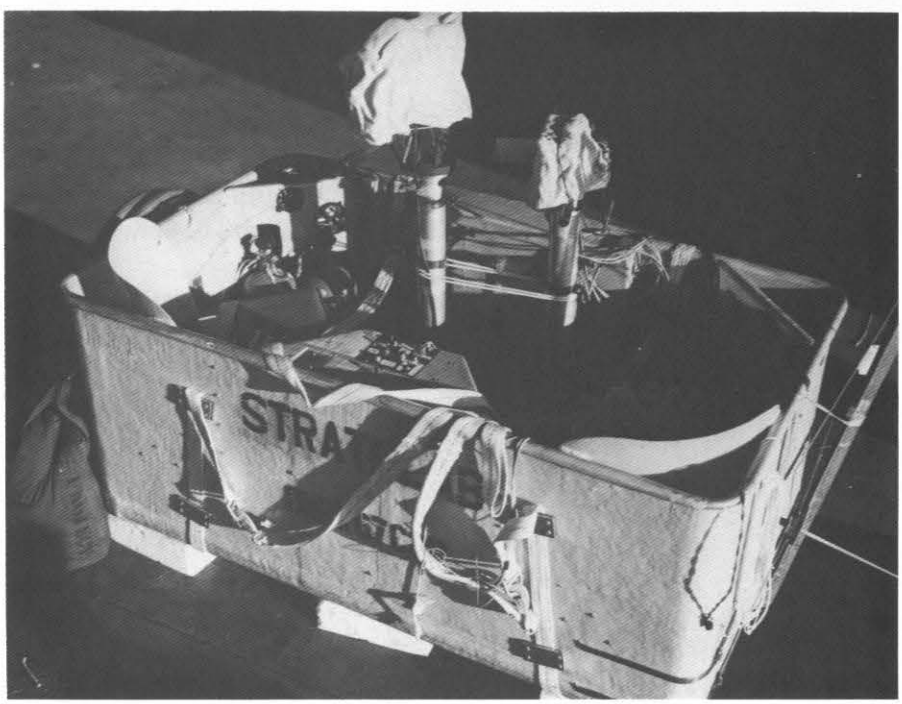
Seymour Stein, a civilian, both from the Pacific Missile Range Biosciences office. *Strato-Lab High 5* contained the most elaborate medical monitoring telemetry network yet employed in a manned flight.

The crew was equipped with Mercury-type Navy Mark IV full-pressure suits modified for this flight. The primary oxygen source for the suit was two liquid oxygen converters with a gaseous oxygen walk-around bottle for reserve or emergency. Additionally, each suit backpack contained a bailout gaseous oxygen supply of 1 liter capacity. The main oxygen supply performed four functions. The oxygen first served to ventilate the suit by carrying moisture away from the pilot; secondly, the oxygen served as a flushing system to maintain the CO_2 level within safe limits; thirdly, the oxygen served for breathing purposes, and fourthly, it provided the necessary pressure within the suit at higher altitudes.

The suit was designed to maintain its pressure at approximately 27,000 feet and maintain its 5 psi pressure above that altitude. The gondola was completely nonpressurized and the only pressurization supplied for the aircrew was through operation of the individual suit and its supporting equipment. At peak altitude, the pressure would be only .09 of a pound per square inch, compared with 14.7 at sea level. Without the heavy pressure suits blood would boil and blood vessels and organs would rupture. In short, the two crewmen would be in an environment virtually equivalent to the vacuum of space.

The Mercury-type full-pressure suits had no inherent flotation capability in the water in the absence of complete suit integrity, and that integrity depended upon the face plate that had



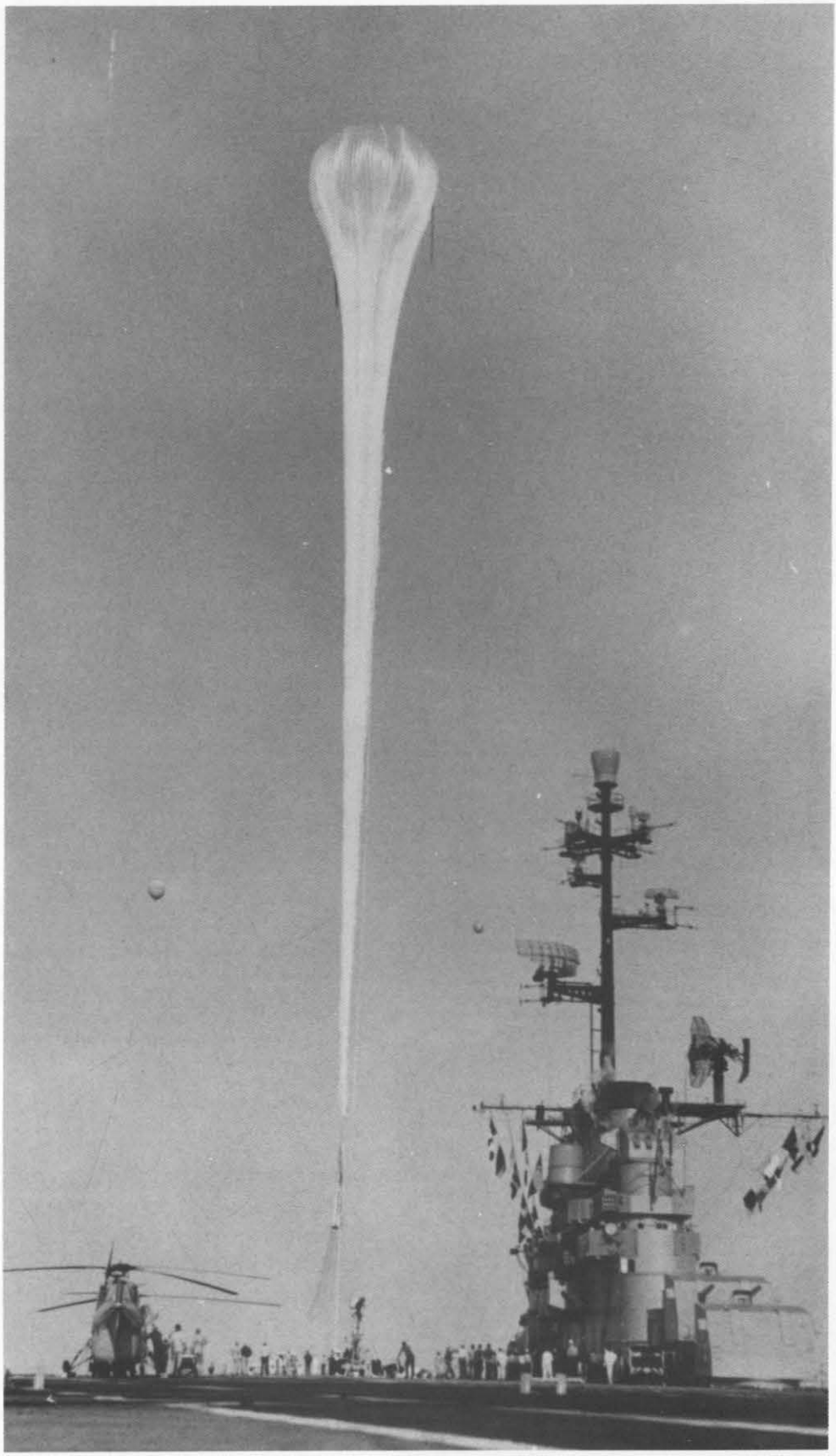


Above: **Ross and Prather in gondola aboard USS *Antietam* (CVS-36) before launch.** ***Left:*** **The first *Strato-Lab* gondola was bright yellow fiberglass, about 45 cubic feet in size and weighing about 150 pounds. It was equipped with two special cameras, oxygen systems, and radio tracking equipment.**

to be closed and sealed. Unfortunately, this feature would later prove fatal.

Besides obtaining medical data, there were other goals as well. Nuclear emulsions were to be transported aloft for postflight analysis to monitor the existence and nature of cosmic radiation.

There were also cameras aboard to record Ross and Prather throughout the flight and to photograph the sky for meteorological purposes. Another cam-



Strato-Lab High 5 **about to ascend from** ***Antietam*****'s flight deck.**

era would take a series of time-lapse photos of the balloon to determine its performance, and still other cameras were to photograph the sky for use in the study of cloud physics. A Navy 70 mm aircraft reconnaissance camera would determine the capability of operational equipment for very high-altitude reconnaissance.

Other instruments measured pressure, temperature, winds, and water vapor in the atmosphere. Some of these instruments were standard issue, others experimental. The gondola also provided a testbed for special infrared instruments being developed for satellite use.

The Flight Plan

The plan was to make an early morning ascent with a planned rate of 800 feet per minute to the anticipated peak altitude of 120,000 feet. After leveling off at that altitude and floating for 1 hour, the pilot would initiate the descent at 400 feet per minute to 35,000 feet and 600 feet per minute from 35,000 to landing. Elapsed time for the flight was expected to be between 8 and 9 hours.

Launch conditions were stringent. The winds throughout the flight had to ensure a landing within 150 miles of the launch site. The surface visibility at launch had to be greater than 5 miles with a ceiling at launch higher than 1,000 feet. The surface winds in the expected landing area could not exceed 15 knots and the sea conditions had

to ensure a reasonably stable flight deck.

The Flight

Because of tears to the balloon caused during inflation and a requisite delay in making repairs, CDR Ross considered aborting the flight. However, the tears were minor and easily repaired.

An hour later the balloon lifted off *Antietam*'s flight deck at 0707. The ascent was uneventful and all systems functioned satisfactorily. The peak altitude achieved at 0947 was recorded at 113,500 by mercury manometer, and 110,700 by beacon.

Because of air in the balloon, early prolonged valving was necessary during descent above the tropopause. This had several effects: There was a longer time than planned at near-peak altitude; their descent to the tropopause was slower than planned, and the descent, after through the tropopause, was faster than originally planned. This too speedy descent required the crew to jettison equipment to slow that rate, and precluded a landing aboard the carrier. It would be a water landing.

CDR Ross asked for and received permission to open their face plates after passing 15,000 feet. Their skillful managing of the ballast lowered the descent rate just enough to ensure a soft water landing at latitude 28 degrees 11 minutes north and longitude 86 degrees 15 minutes west. The balloon detached on impact and the gondola remained upright. The parachute fell into the water as planned but did not release from the gondola. The crew was unable to activate the mechanical releases as planned.

Aftermath

The recovery of the two crewmen was to offer nothing unusual. Their gondola bobbed in the water approximately 1 mile from *Antietam*. The plan was to recover the crew with a motor whaleboat as the primary means of pickup. But since three helicopters were hovering nearby almost immediately, the plan suddenly changed. There was a decision to make an unrehearsed helicopter recovery. Both men were physically and mentally fatigued to an extreme degree but nevertheless were psychologically elated from their success. Neither man had bothered to relower his face plate and both remained open.

The helo then lowered a device known as a Boyd Hook, a three-prong device. The person to be recovered was to straddle the prongs and grip the cable. CDR Ross, after inviting LCDR Prather to go first, which was denied, then grasped the cable, his face plate remaining open. As he did so, he stepped onto the Boyd Hook, contrary to proper procedure, and his foot immediately slipped from one of the prongs. Still retaining his grasp on the cable, he pulled it between his legs, slid onto the hook and was hauled aboard.

Then tragedy struck. When the hook was lowered for Prather, he stood on a float attached to the side of the gondola. Grabbing the cable and pulling it toward him, he too stepped onto one of the prongs with one foot, the other foot remaining on the float. The seat swung in an outboard direction as his weight pushed the gondola to the rear. Suddenly he lost his grip on the cable and fell backwards into the water from about a 3-foot elevation.

The crew had been under the impression that the suit was watertight. It was with the face plate closed. But with the plate open, Prather immediately began taking in water. By the time the helo returned after freeing a stuck hoist and dropped a rescue swimmer, Prather had drowned.

Notwithstanding the last-minute tragedy, what had *Strato-Lab High 5* accomplished? Besides achieving a new altitude record for manned balloon flight, *Strato-Lab*'s instruments had determined that protons, associated with solar flare activity on the sun, were of such high intensity as to have an ominous import regarding their effects on man in space. This discovery required development of a system whereby solar flare activity could be predicted and monitored. The mission also validated that telescope astronomy provided a means of obtaining photographs of a quality and resolution heretofore impossible with earth-bound telescopes. Subsequently, an infrared system enabled unprecedented astronomical study.

The flight had lived up to all its expectations, save one. A crewman had been tragically lost—and only after the most dangerous portion of the mission had been completed. *Strato-Lab High 5* had ended on a sad and embarrassing note.

But the legacy of *Strato-Lab High 5* is perhaps unknown for another reason. On the very next day, the record balloon flight was totally eclipsed on the front pages of the world's newspapers as another American flew to the edge of space. On 5 May 1961, astronaut Alan Shepard took his historic 15-minute suborbital flight aboard a Mercury Redstone rocket. The rest is history.—JKH

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Case Management in the Military Health Care Setting:

Development of the Health Plan Model

JoAnn Faust, R.N.
CDR Marsha H. DeWeese, NC, USN

Health care in the 1990's is experiencing radical changes that will continue to evolve and affect health care professionals, systems, and patients well into the next century. The military health care system is not exempt from these challenges of declining funds, shrinking resources, and escalating health care costs. Health care reform, managed care, and capitation are being developed and implemented at the highest, as well as the lowest, levels of military health care.

Managed care is a system-oriented approach to health care. It is an evolving force whose purpose is improvement of business and management practices of health care facilities so that efficient, comprehensive, cost-effective services are available across the health care continuum.(*1*) Capitation, a major tool of managed care, is a reimbursement system in which each medical treatment facility receives a fixed amount of money for each beneficiary enrolled in TRICARE Prime regardless of services provided. Capitation forces a focus on efficient and effective management of resources in the Military Health Services System (MHSS).

The cost of care will continue to be a major concern to all involved in the military health care system. The ultimate challenge will be seeking alternative and more cost-effective ways of providing health care while maintaining and improving the quality of care.(*2*) Emphasis on achieving the goals of quality care and cost-effectiveness are imperative to the survival of the direct care system within the MHSS.

Case Management

Case Management (CM) has received a great deal of attention in the private sector over the last few years as an effective tool for managing the health care delivery of specific patients. While managed care is driven by economics, balance is provided by CM to ensure caring and quality.(*3*)

CM places the patient at the center of the health care delivery process with emphasis on prevention, high-quality care, improved patient outcomes, and financial savings or cost avoidance for both the patient and medical facility.

CM is a process which takes on a variety of models and differs depending on the setting in which it is implemented. Not all patients require CM. Patients targeted for CM include those who are high risk, problem-prone, or have complex care needs. Coordination of care for these patients spans the continuum over time, occurs wherever the patient is receiving care, and involves the multidisciplinary team. The goal is to provide seamless care spanning the inpatient and ambulatory arenas to improve cost-effectiveness and enhance quality. This article will describe a joint endeavor between National Naval Medical Center (NNMC), Bethesda, MD, and Walter Reed Army Medical Center (WRAMC), Washington, DC, to develop a CM proposal to meet the demands of implementing TRICARE in an "integrated" setting.

With the TRICARE managed care support contract nearing completion, it became evident to the Utilization Management staffs at NNMC and WRAMC that we needed to focus on a CM program for the National Capital Area. Department of Defense, Health Affairs, mandated CM for the following Diagnosis Related Groups (DRGs): head trauma, spinal cord injuries, AIDS, neoplasms, neonates in NICU, bone marrow transplants, and major burns.(*4,5*) Patients in these DRG categories are typically high risk, problem-prone, and high cost. Other diagnoses that will be evaluated for a CM program include trauma, cystic fibrosis, high-risk obstetrics, repeat admissions, multiple ER visits, dialysis, diabetes, COPD, and CHF.(*4,5*)

In July 1996 a multidisciplinary work group was formed to develop a proposal for the NNMC/WRAMC CM program. The group, consisting of physicians, nurses, and social workers, represented a variety of inpatient and ambulatory care specialties and areas. Educating the group on the concept of CM was vital as group members had differing ideas on CM models and the role of the case manager. Utilizing information from the Case Management Society of America (CMSA), the Certification of Insurance Rehabilitation Specialists Commission, and the Northeast Region Utilization Plan, CM was defined as:

"An interdisciplinary process, facilitated by a case manager, which assesses, plans, implements, coordinates, monitors, and evaluates options and services to meet beneficiaries' complex health needs throughout the continuum of care to promote quality and cost-effective outcomes."

Research on different models of CM was conducted and presented to the members of the multidisciplinary team. Several models were considered.

Hospital-Based Models:

Unit-Based Model: The case manager is assigned to oversee the care of all patients on a particular nursing unit and manages only those patients requiring active intervention. This model deals primarily with the present episode of care and coordinating that care from admission to discharge from the hospital.(*6*)

Service Line Model: The case manager is assigned to a particular service line such as cardiovascular surgery or high-risk obstetrics. The case manager follows the patients as they move throughout the hospital as long as they stay within that service line. Transfer to another service frequently involves shifting the patient to another case manager.(*6*)

UM/Discharge Planning Model: The case manager relies on identifying patients through a preadmission or precertification process, continued-stay reviews, and discharge planning meetings.

Advanced Practice Model: Disease management is utilized and early intervention of the case manager minimizes the time clients spend in the hospital. Stress is placed on outpatient services and a strong network of community support. This CM model is usually organized around specific client populations such as AIDS, mental health, and substance abuse.(*7*)

Health Plan Model: This plan coordinates care across the continuum and will not duplicate services between sites of care. It coordinates both inpatient and outpatient management. The plan works from a corporate level managing care through the end of life, return to health, or disengagement from the health plan.(*8*) The Health Plan Model was selected by the work group as the foundation for development of CM in the National Capital Area.

The Health Plan CM Proposal

In October 1996 a nationally recognized health care consultant in the area of hospital and health plan CM was invited to address the NNMC/WRAMC working group to discuss issues pertinent to our integrated health system. The consultant assisted team members with understanding how a Health Plan CM model differs from other models. Problems and challenges associated with developing a CM

Table 1. Diagnoses and Patient Numbers
(RCMAS, January-October 1996)
(NNMC and WRAMC)

Diagnosis	# Patients Admitted in 1996
Head Trauma	89
Spinal Cord Injuries	27
HIV/AIDS	211
Neoplasms/Other Malignancies	535
Diabetes	139
Cardiac/Respiratory (includes COPD)	4,265
Neonates in NICU	435
High-Risk OB	568
Transplants/Dialysis	10/11

Table 2. Case Managers: How Many?

Diagnosis	Recommended # of Case Managers
HIV/Liver/Kidney	1
Malignancies/Neoplasms	4
Spinal Cord/Paralytic/Neuro/Trauma	1
Cardiac/Respiratory/Diabetes	6
High-Risk OB/NICU	2
Total recommended for NNMC and WRAMC	14

program were addressed along with an in-depth discussion regarding how to plan for and develop CM in the National Capital Region. A timeline for developing and implementing a CM program was outlined by the conclusion of the 2-day workshop.

The CM development phase involved writing a position description for a case manager and gathering pertinent data on the number of inpatients in the specified DRGs. The position description included detailed information on the major duties and responsibilities of a case manager. Qualifications of the case manager include current professional licensure, current certification in case management (CCM), and an in-depth knowledge of health, social services, and funding sources. A proven record of cost savings is also important when seeking to hire the most experienced, capable case manager.

Information on the patient population to be managed was gathered using data from the Retrospective Case-Mix Analysis System (RCMAS). Table 1 summarizes the 1996 combined inpatient RCMAS data from WRAMC and NNMC for the mandated DRGs. Using this data, the proposed number of case managers was determined. The desired number of case managers per patient population for both facilities is shown in Table 2. WRAMC chose to assess their internal assets to be utilized as case managers. NNMC chose to seek contract funding to obtain experienced case managers. The proposed numbers of contracted case managers and populations to be case managed for NNMC are detailed in Table 3.

NNMC's justification for contracted case managers was two-fold. First, while NNMC had talented staff, no one held a certification in CM or had significant CM experience with a proven record of cost savings. Second, some CM initiatives existed but to a limited degree since staff had other responsibilities. A successful CM program was implemented in the Breast Care Center utilizing two case managers who are responsible for approximately 40-60 patients each. Funded by a DOD grant, these case managers coordinate care for the breast cancer patient from initial diagnosis through 6 months postsurgical procedure. Patient contact is primarily within NNMC or by telephone.

Table 3. Recommended Contract for Case Management Program

Diagnoses/Patient Population	# Case Managers
High-Risk OB/NICU Infants	2
Neoplasms	2
Internal Medicine	2
Total for NNMC	6

An expected caseload per case manager consists of 20 to 30 active patients who screen for CM. There are five levels of care intensity in CM.(*9*) Level one is basic discharge planning. These cases require telephonic CM with little paperwork. Level two is intermediate discharge planning. These cases are also telephonic and require little paperwork. This level may involve a patient being discharged with home IV antibiotic therapy. Basic CM is level three. Patients usually require one on-site visit and one report to the referring provider per quarter with some additional telephonic CM. The patient is usually chronic and requires continued, multiple services of a routine nature. Patients in level four, or intermediate CM, are more involved and usually have conditions or injuries of a sudden, acute onset, such as an automobile accident patient with multiple injuries requiring rehabilitation. Catastrophic CM is considered level five. These patients are complex, high cost, and frequently long term. NNMC's Health Plan CM program will target patients in levels four and five who require extensive coordination of services, daily contact, and frequent intervention by the case manager.

Case managers assist patients with acute or chronic diagnoses by ensuring that access to care is timely and that care is delivered according to a multidisciplinary plan, pathway, or guideline for treatment and resource use.(*8*) Their scope of responsibility includes the acute episode as well as events prior to and following admission. CM effectively brings together diversified resources and promotes the appropriate level of care.(*8*) There is considerable provider and patient satisfaction when CM is practiced. CM improves the satisfaction of the providers whose work may be made easier by the coordination and communication of the case manager. Patients and their families express satisfaction as they experience efficient and well-coordinated delivery of care and gain a good understanding of what comes next.(*8*)

Program Implementation

A contract for experienced case managers has been drafted and submitted to the Healthcare Contract Office at NNMC. In addition, working forms for consent, screening, assessment, and cost-savings determination have been developed for the case manager to use. Marketing the CM program will play a large role in its success, especially in education of the health care team at NNMC, WRAMC, and outlying clinics. This is essential to prevent an influx of referrals to the CM program that can be handled by other means such as discharge planners and social work. As of this writing, the Managed Care Support Contract selection is in progress and we are waiting for final authority to proceed with the implementation of our program. A future article is planned to describe the actual implementation of the program and achievement of outcomes based on quality, patient and provider satisfaction, and cost reduction.

Summary

According to CMSA(*10*) for every $1 invested in CM there is an approximate $7 return on the investment. It is imperative that the savings realized by CM be identified. By utilizing CM, savings can be achieved through appropriate utilization of services and resources, improved outcomes from a given episode of care, and a decreased length of stay.(*8*) Proactive recognition of patients who would benefit from early intervention by CM is a viable solution to resource savings in this new capitated environment. CM offers an opportunity to improve the efficiency and effectiveness of health care delivery for our military beneficiaries, health care providers, and the military health care system.

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Woman Prisoner of Japan

Leona Jackson, R.N.

The July-August 1998 issue of ***Navy Medicine*** *reported the recent passing of CAPT Wilma Leona Jackson, fourth Director of the Nurse Corps. As a junior nurse stationed at Naval Hospital Guam, Jackson and four of her colleagues [Virginia Fogarty, Marian Olds, Lorraine Christiansen, and Doris Yetter] became the first American military women POWs when the Japanese seized the island on 10 Dec 1941. Even though her imprisonment in Japan was brief, she recalled the memories of that bitter experience in a document she wrote following her return to the United States in August 1942. Following are excerpts from that memoir now in the BUMED Archives.*

The planes come again, droning, and I make for the nearest cover. It is the linen room. I dash across the threshold, and suddenly come to a dead stop. The room is long and narrow, with a table in the center. It is almost crowded with native nurses. Many of them are huddled together beneath the table. The others, those who could not squeeze beneath it, are kneeling on the floor. They are pale with fright, almost white, almost as white as the uniforms that gleam in the semi-darkness. A few of them are still, utterly, completely, quiet, unmoving, hardly breathing. Most are saying their rosaries. The intonation rises as the planes come overhead, mingling with the increasing roar, as in a frantic effort to make God hear them.

Mentally, I take roll call. Yes, most of the nurses are here. The first wave of planes is receding, and I run outside, out into the bright afternoon sunshine, across the square toward the hospital. The rosary fades and dies behind me. First to Ward Three. The patients look their unutterable relief as I come down the ward. Then the sound of returning planes, and the sound is reflected in their faces. I seize a mattress from an empty bed and erect a shelter over one patient. Then a native woman appears and helps me with another. Not that I have any faith in such a barricade, but it satisfies the urge to do something, anything. The planes pass on. One of the convalescent patients picks a bullet from the floor, not a yard from my feet. I put it in the pocket of my uniform, without thinking about it, or knowing why.

In a little while casualties and reports were both arriving. We heard the *Penguin* (AM-33) was sunk, all officers lost. Three of her four officers presently arrived at the hospital. So that, at least, was untrue. The ship had been attacked by planes. The gunnery officer was killed by machine-gun fire. The captain, realizing that he couldn't get the ship to sea and escape that way, had scuttled her. His arm was broken, but he had brought the gunnery officer's body ashore. The other wounded had been brought in by their shipmates. Marines picked them up on shore and rushed them to us at the hospital. That was the first impact of war. We had had a baptism of fire.

The night passed quickly. The planes have all gone and the silence is deafening. The afternoon passes and it is night again, our second night of war. I stand for a long time on the lanai looking out toward the hills. They are like a dark screen, a wall, beyond the lovely, silvery, iridescence of the moonlight. There is no sound but the low pounding of the surf. It is so peaceful here. I go inside the house and lie down. Get some sleep. Get ready for whatever is coming.

The sound of shots awakens me. It seems only a moment since I went to sleep. Scattered shots and then silence, ominous and complete. I go out on the lanai and stand there . . . A few minutes pass. No other sound now but the surf, and a dog barking. I lie down again and close my eyes, but now there is no sleep. Another half-hour. More shots now. We dress in the darkness, quietly, but quickly as we can. Soon we hear the others moving about. It is in total darkness, but we hear the low hum of voices. This is just off the emergency room. It is the best place for news. Any news will come to us here. We wait there in the darkness, talking. The gunfire seems closer.

Suddenly a car comes into the hospital compound and grinds to a stop. It is Bill Hughes, an ex-Marine, married to a native woman. She is with him in the car. So is her brother. All are bleeding profusely from bayonet wounds. Bill says they met the Japanese on the road to Agana. Bill knew what to do. He had been fooled for a moment. He had stopped, mistaking the Japs in the darkness for our own Marine patrol. They had jumped on the running board, and then he saw his

mistake. He had thrown the car into gear and started up. The lurch threw them off the running boards. As they fired at the car, he had leaned low over the wheel and sped to Agana to give the alarm and to us for help. Joaquina's brother is dead. She herself has lost much blood. The shots are coming in volleys now, much closer. At last, they are right outside our compound, in the plaza. We press ourselves against the walls, crouching.

Now the machine-guns are hammering in the plaza. It is futile, hopeless. Why don't they stop? We have only a handful of men. There can be no defense, only slaughter. Above the sound of firing, we hear an automobile horn. Three long blasts. "Cease firing." It brings a queer, gone feeling to us. Then a high pitched shout arises. "Banzai!" It seems to rise again and again, interminably. Dawn has found us. Disheveled, weary, I move to the door. Beyond the cathedral, over the plaza . . . the Rising Sun ascends the flagpole where yesterday the Stars and Stripes had proudly flown.

It had been a strange month, the strangest in my life. The Japanese had swarmed over the island like a plague of grasshoppers on December 10th. Will the bitterness of that memory ever fade? We had seen Japanese soldiers in our compound since about nine o'clock. As yet, we had remained unnoticed. How long, we wondered, would this state of grace continue? Ten o'clock had come and with it our commanding officer, rambling down the walk to our front door. "They will allow two of you to go to the operating room. Some work to do over there." Chris [Lorraine Christiansen] and I arose to go.

We had some work to do all right, three tables full of it. The corpsmen had been allowed to go to the operating rooms before us and the doctors joined us there. Chris went to one operating room and I to the other. The morning was busy. It was such a relief to be busy. It lessened the apprehension, the waiting.

It was time for the last patient to go on the table. A native youth with machine-gun bullets in his abdomen. As I adjusted the blood-pressure cuff and took my place at his head he said to me, "Will I die?" "I don't think so," I answered. "I don't care if I do. If I die I will not have to live under these Japanese." He never lived under the Japanese.

Time lost all significance after we realized that for us there would be no relief. On one of these days . . . a big Japanese Navy captain seated himself, uninvited, in our living room. Two of us were there. He opened the conversation with, "Have you had any news?" "None," we answered briefly. "Your Navy. So sorry to tell you. All sunk." "Too bad," my companion answered, never missing a stitch of her crocheting.

In the hospital, work went on as usual. Life, Death, and the Great Hereafter. The Japs had occupied all wards of the hospital but one and all patients were cared for here; men in one end of the ward, women in the other. The detachment of hospital corpsmen retained at the hospital had to be quartered here, too, for the Japs had taken over their quarters. Beds were occupied in shifts and men slept where they could, day or night.

Morale and discipline, even under these crowded conditions, were excellent. The corpsmen ran the laundry and the kitchens, preparing food for patients, Japanese officers, and all prisoners retained at the hospital, still managing a joke and a smile. There was no relaxing of the standards of medical or nursing care in spite of the sentries who swaggered throughout wards, interfering in anything they did not understand. And now it is our last roll call. The ward looks strangely bare without the American men in the line. There are only five of us now and our native nurses. The Japs look us over and count us for the last time and as they leave the ward we break the line.

We were four days at sea from Guam to Japan. Four days and nights which merged into each other and were the same —for all portholes were blacked out. Four days with a half-hour each on deck: four nights when we lay down to sleep wondering if we would waken another day. For we were prisoners of war. Did our people know, or would the white painted *Argentina Maru* serve as a target for one of our own torpedoes?

There were seven of us, five nurses, the wife of a Chief Petty Officer, and her six-week-old baby, in a four-berth stewardess cabin. We had brought a bassinet from the hospital nursery for the baby, but only four could sleep in the berths. So we took our turns, two each night, sleeping on the "tatami" that covered the floor of our cabin.

The rest of the prisoners, officers, men and civilians, had been herded like cattle into one of the cargo holds of the vessel. They had come aboard with scarcely more than they wore on their backs. Only a few had been able to get any extra clothing. The second day out the Japanese gendarmerie who formed the guard detachments had produced some trunks of winter clothing, most of which had been taken from the Marine Base at Sumay.

On the fifth morning we lay at anchor. We were given two slices of bread for breakfast. Finally, about six p.m. we were hurried on deck. The harbor was dark but we could make out the vague outline of a barge-like craft along side. We climbed over the rail of the ship and onto the barge. The women and baby were directed to the wheelhouse where a charcoal pot burned. The heat was welcomed, for the night was bitterly cold to those of us, inadequately clad, just out

of the tropics. The other prisoners were loaded onto the barge. Some of the patients, on the stretchers appeared to be covered only with a sheet.

A short trip across brought us to land. Here the full force of an icy wind struck us, hurling snowflakes in our faces, striving with freezing fingers to wrest our clothing from us. There was a light covering of snow underfoot, the first we had seen in many months. We were hurried along through the station. The women and patients were loaded into ambulances and buses and set out for our destination. The other prisoners were corralled in the station and greeted with much ceremony by the general. They came late to the camp in streetcars.

After a bumpy ride in a bus we drove into a compound. The bleak exterior of the building was lighted feebly by a few electric bulbs, hanging forlornly on their length of wire. It looked cold and forbidding indeed. Inside the building was like a long unused barn. We were taken upstairs to a huge room that extended the width of one wing. On the floor against each wall and extending about six feet out into the room were rows of mats over a light padding of straw. On these the patients were being placed, like horses being bedded down. A few Japanese soldiers bustled about with blankets, covering the patients.

Here we were met by a short, peppery middle-aged colonel and a second lieutenant. The lieutenant spoke English haltingly, "Patients, here," pointing to one side of the room; "nurses, here." The hand indicated the other side. We stared, dumbfounded, for a minute; then in unison, "No." "Patients here; nurses, here," he repeated patiently. We shook our heads negatively, then began to explain in rapid and exasperated English that in America we weren't quartered with our patients; that there were numerous corpsmen among the prisoners who could be quartered here without embarrassment to anyone. The colonel took a hand, waving us to one side of the room, patients to the other. Still we said, "No." The colonel yelled, "Yes," turned on his heel and left. Finally, unable to keep up with our conversation, the lieutenant took us to another dormitory in the barracks. We had our privacy.

The other prisoners arrived by this time. Bread and soup were given us; blankets were issued. Without any more ado we removed hats and shoes and went to bed. I have never been colder in my life. Fully clothed and covered with five blankets, I shivered until morning.

Most of the prisoners had very little clothing. We had included needles and thread in the things we packed in Guam, so we were busy. Our days were spent mending in an effort to keep the meager clothes supply in as good condition as possible. Repairs were never ending.

At first it seemed that the non-combatants might be exchanged; then word came through that all would stay at the camp, so we settled down for a long haul. It was quite unexpected then, one day in March, when we were told that we would be transferred to Kobe. We weren't very keen on Kobe. "Better the evil that you know than that you know not" was our reaction. "You're on your way home, Jack," said one of the officers to me. "I don't think so," I answered skeptically.

It was the night before our departure when many of the officers and men gathered in the Warrant Officer's dormitory across the hall to give us a farewell "sing-song." The major's fine voice rang out as he led the chorus in the old, old songs. It ended with "Auld Lang Syne." As long as I live I shall remember standing at the door—tears in my eyes, a lump in my throat, and the voices of the men, singing their goodbye.

Kobe, the international city, the Japanese call it. We lived in the foreign section of it. Lived with other internees, citizens of the allied nations.

One fine day in April I was sitting in the garden with some friends when a formation of planes came over. They were proceeding at a leisurely pace and they were flying low. We hadn't seen any planes overhead for some time so we gave them a good look. Suddenly, in a voice full of suppressed excitement, my companion said quietly, "Those are not Japanese planes." "No," I answered. "They're American! I don't know if they're Army or Navy, but I know some fellows in both just nervy enough to fly that low around here."

There was a dull report as bombs dropped in the distance, and the planes disappeared across the bay toward Osaka to leave their "calling cards" there. (The POWs were witnessing the Doolittle raid of 18 April.)

A few weeks later we were informed by the Swiss Consul that we would go home on the exchange ship with the Diplomatic Corps and other Americans being repatriated. George had been right in his prophesy when I left camp. I was on my way home.

We went to Yokohama, one day in June, and aboard the *Asama Maru*. Then we lay in Yokohama harbor for a week. The eighth night Chris and I had turned in early. There didn't seem to be anything to stay up for. It looked like we were anchored for the duration. Jo [Virginia Fogarty] awakened me. "Chris! Jack! We're underway!"

We became conscious of the throbbing of engines under us. The glow reflected on the water as the huge crosses that marked our ship lighted up. We were underway indeed. We wondered—to what new adventure? ❑

The museum's living history program features a Union hospital steward at work.

Museum Showcases Civil War Medicine

Debby Ellen Moone

The rapidly developing National Museum of Civil War Medicine (NMCWM) in Frederick, MD, is presently the only museum in the world devoted exclusively to the study and interpretation of American Civil War medicine (1861-1865). The NMCWM is a private, not-for-profit 501(c)(3) corporation which receives no ongoing operational funding from federal, state, county, or city levels. Its mission is to educate a national and international audience about the true story of Civil War medicine. These studies include understanding the impact of Civil War medicine on modern medical practices.

At the time of hostilities in 1861, both the North and South believed the war would be short and casualties few. Consequently, the war began as a great adventure, but soon became a nightmare that killed over 620,000 soldiers and maimed countless others. It resulted in the highest number of American casualties per capita than any of our wars to date. Former Surgeon General C. Everett Koop has called the Civil War a "watershed in American medical history." The wide-

spread disease, high casualties, and bone-shattering wounds left a legacy of brutality and horror; however, the resulting reforms in medicine changed all of our lives forever.

Military medical personnel will be especially interested in the NMCWM since the Civil War has special meaning to them. The war not only moved the transformation of nursing from a menial service into a respected profession, but also produced important changes in military medical practices including advances in anesthesia, pain relief, sanitation, triage, medical evacuation, general and reconstructive surgery, railroad and steamboat hospitals, hospital construction, organization, and administration. Additionally, the Civil War was the first war where we recognized medical personnel as noncombatants. Prior to the Winchester Accord in the Spring of 1862, medical officers were considered prisoners-of-war and were interned until paroled. This agreement, the work of Confederate surgeon Hunter Holmes McGuire, made the provision that physicians would be regarded as noncombatants and not subject to imprisonment.

Surgeons in the Civil War were confronted with horrific battle casualties as Napoleonic tactics collided with the rifled barrel and other rapidly changing technology. This resulted in a dramatic improvement in surgical techniques. More arms and legs were amputated during the Civil War than any other war in our history. Three of four operations performed were amputations.

As the result of the advent of the Minie ball,* surgeons were often referred to as "butchers" and "sawbones." This .58 caliber soft lead bullet was cone-shaped with a hollow, grooved base that spun the bullet as it left the new rifled muskets. The hollow base expanded to fill the rifling when the Minie ball was fired causing it to receive the full force of the gunpowder resulting in a ball that left the rifle-musket at a higher velocity with greater accuracy than the old round musket balls from smooth bores. On impact, the tip of the cone would flatten out. The result was savage bursting wounds. Bony structures sustained extensive fissuring and long bones were shattered, splintered, and split. Consequently, this type of damage led to a dramatic increase in infection.

Approximately 94 percent of all injuries were caused by Minie balls. Statistics consistently demonstrated that a Soldier stood a much better chance of surviving these injuries if the damaged area could be amputated. The survival

*The Minie ball was named for its developer, CAPT Claude-Etienne Minie, Inspector of Musketry at the Vincennes Military School in France.

Field hospital operating table at the museum. Note the amputation kit. ***Opposite page:*** **One of the museum's prize possessions is this four-wheeled ambulance wagon. The ambulance corps developed by Dr. Jonathan Letterman, Medical Director of the Army of the Potomac, had its first real test at the battle of Antietam, the Civil War's bloodiest day.**

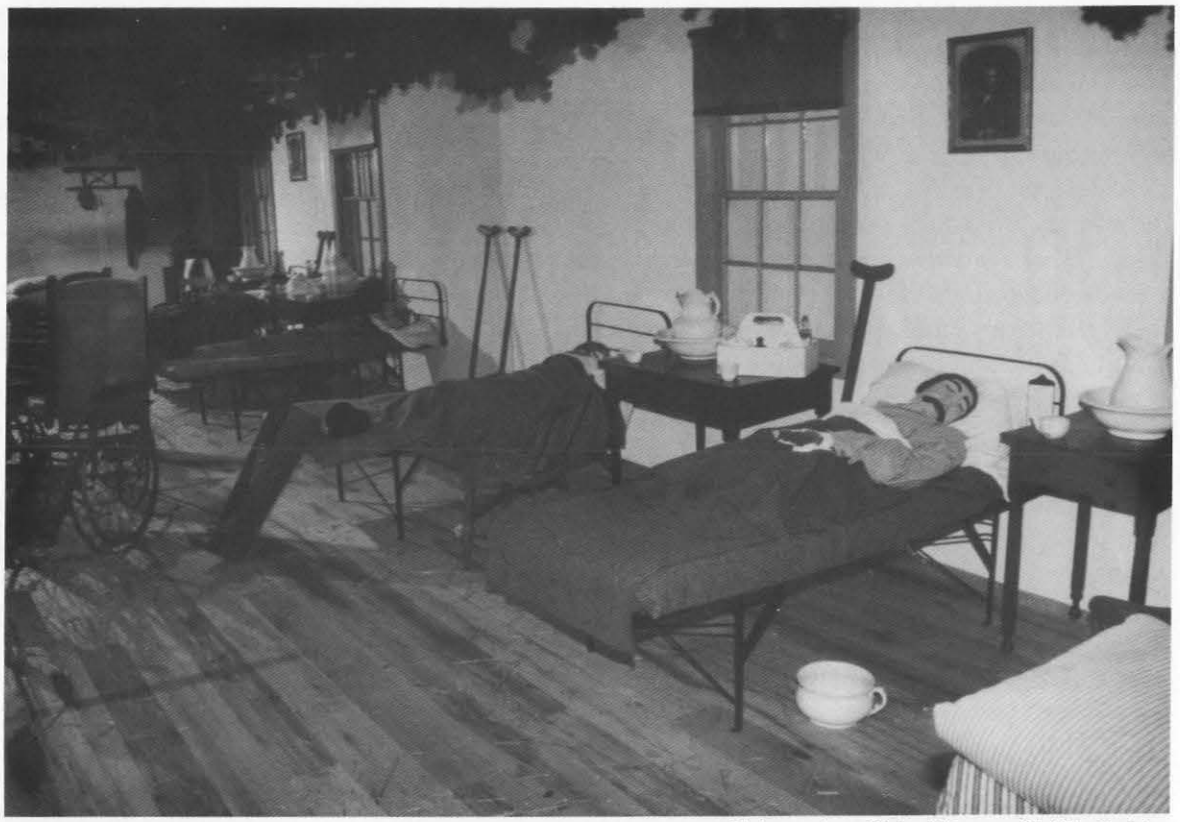
rate nearly doubled when the amputation was performed within the first 24 hours after injury. It is estimated that over 50,000 amputations were performed during the Civil War.

As devastating as these injuries were, the primary killer during the war was disease. The huge camps of both armies were breeding grounds for infection. In these temporary cities, hundreds of thousands of farm boys faced childhood disease for the first time and died in droves—many of them before seeing any fighting. Poor sanitation and nutrition were also major contributors to disease. Diarrhea, dysentery, typhoid, typhus, pneumonia, smallpox, measles, tuberculosis, and scurvy killed thousands. Insect-borne maladies such as malaria and yellow fever also took their toll. For every soldier who died as a result of battle wounds, two died of disease.

By 1862 the Union Army of the Potomac was unable to cope with tens of thousands of wounded and sick soldiers. In June 1862 U.S. Army Medical Corps veteran Dr. Jonathan Letterman was appointed Army Medical Director. What he did changed the history of military medicine. Dr. Letterman devised an evacuation and ambulance plan that was tested for the first time at the battle of Antietam in Sharpsburg, MD, on 17 Sept 1862. This 1-day battle produced 23,000 casualties—the most of any single day of fighting for the entire Civil War. It is estimated that the casualties fell that day at a rate of 2,000 per hour.

Dr. Letterman's plan was a resounding success. It introduced triage on the battle line, a layered system of field hospitals and efficient use of skilled surgeons and medical personnel. The Letterman plan remains the basis for present military medical evacuation systems around the world. MGEN Paul Hawley wrote, "I was chief surgeon in the European theatre . . . . during World War II . . . there was not a day . . . that I did not thank God for Jonathan Letterman."

Although losses in killed and wounded afloat were much less than in the horrific battles ashore, the Navy medical staff (especially on the Mississippi, James, and Potomac Rivers) were called upon to assist the Army medical staff in caring for the sick



The "pavilion" style general hospital was the last stop for a wounded or sick soldier. Cleaner and more efficient than a field hospital, the general hospital offered patients a much better environment in which to convalesce.

Photos courtesy of National Museum of Civil War Medicine

and wounded soldiers. Hospital ships had medical staffs as large as the hospitals ashore. Each ship usually had a surgeon and an assistant surgeon aboard. The *City of Memphis* carried 11,024 sick and wounded in 33 trips up and down the Mississippi. The *D.A. January* transported and cared for 23,738 patients during the last 3 years of the war. Other ships used included the *Empress*, *Imperial*, and *Louisiana*.

The most famous of all was the U.S. Navy Hospital Ship *Red Rover*. The steamer *Red Rover* was built as a side-wheeler steamer at Cape Girardeau, MO, in 1859. She was purchased by the Confederacy on 7 Nov 1861, to serve as a barracks and accommodations ship for the crew of the floating battery at New Orleans, LA. After the fall of New Orleans, *Red Rover* assisted in the defense of Columbus, KY, and then joined the Confederate blockade of the Union Western Flotilla at Island Number 10. Acting Master C. Domily of the Gunboat Mound City, captured *Red Rover* on 7 April 1862. Having been damaged by mortar fire, *Red Rover* was temporarily repaired and moved to St. Louis, MO. There she underwent more extensive repairs and was converted into a hospital ship, the first of her kind, by Quartermaster George M. Wise, U.S. Army, with permission of CAPT Charles Henry Davis, Commodore of the Western Flotilla.

During that conversion, the Sanitary Commission, an organization of civilians whose primary concern was the welfare and care of the sick and wounded, provided $3,500 for the use of *Red Rover* and contributed advice on her conversion to a hospital ship. When the conversion was completed, *Red Rover* had bathrooms, a laundry, an elevator between decks, an amputation room, two kitchens, and all of her windows had been covered with gauze to keep out the flies and mosquitoes. Dr. George H. Bixby of Cairo, IL, was appointed Assistant Surgeon and was placed in charge of all aspects of the ship except navigation. The Sisters of Holy Cross, an order of Catholic nuns trained to care for the sick and wounded, volunteered to serve on board *Red Rover* as nurses pioneering the Navy Nurse Corps of today.

Upon completion of her conversion, *Red Rover* joined the Western Flotilla on 10 June 1862. Two days later she received her first patients. Ironically, they were casualties from the gunboat *Mound City*, the ship that had captured

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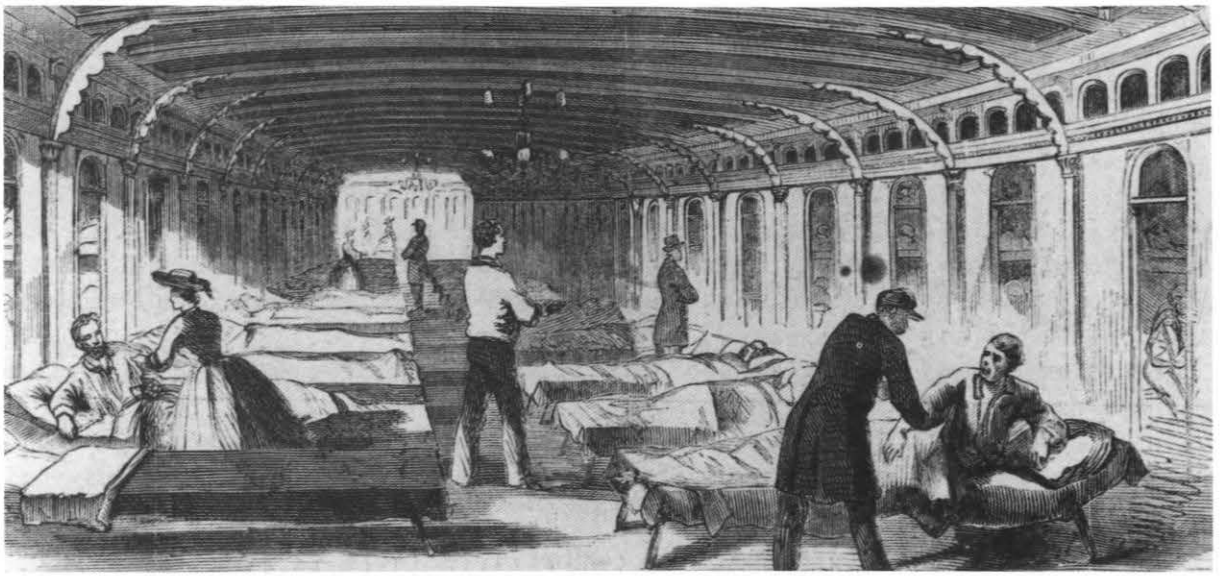

A sanitary steamer's ward was luxurious compared to what the sick and wounded usually confronted.

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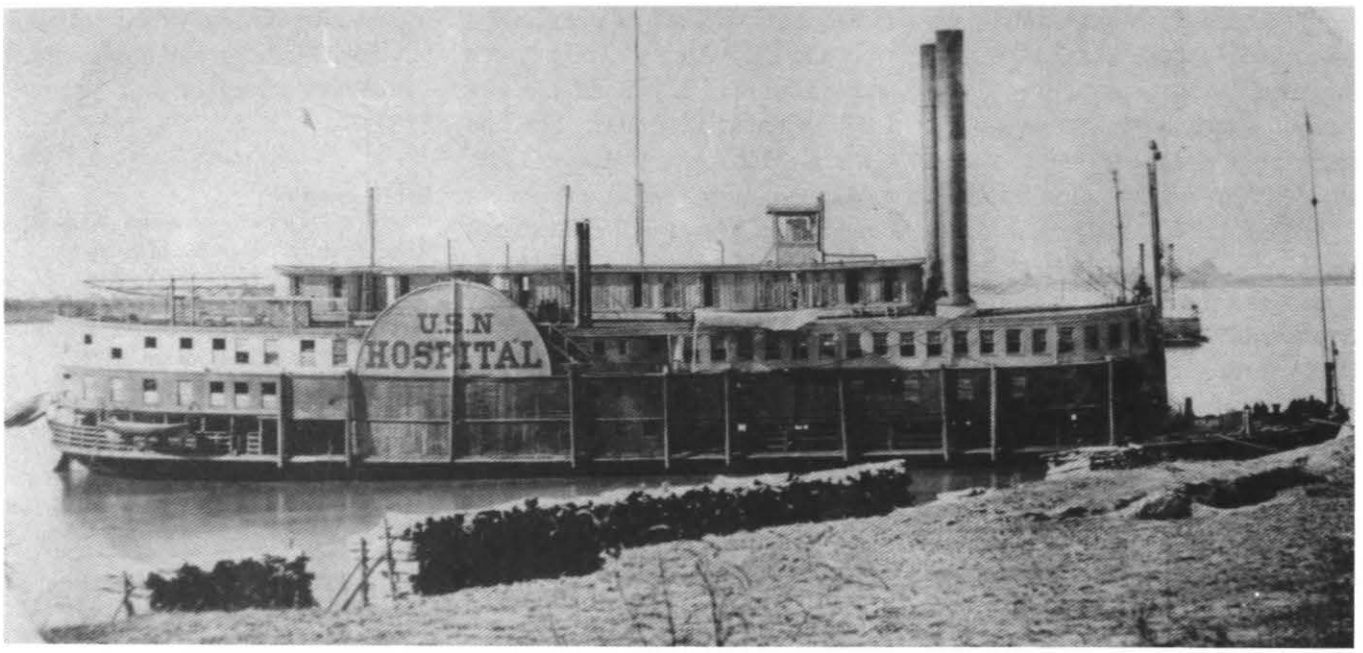

Red Rover

her in April of that same year. First under the control of the Army, *Red Rover* was officially transferred to the Navy on 1 Oct 1862 and commissioned as the U.S. Navy Hospital Ship *Red Rover* on 26 Dec 1862.

Red Rover and three other ships, the *D.A. January*, *Empress*, and *Imperial* served the Western Flotilla as hospital ships during the remainder of the Civil War. They received sick and wounded from all naval and land engagements of the Mississippi River. At the end of the War in 1865, *Red Rover* and *D.A. January* had provided care and comfort to approximately 50,000 patients during their careers as hospital ships. With the Western Flotilla no longer needed, its ships were decommissioned and put up for sale. On 12 Aug 1865, the crew of *Red Rover* was transferred thus ending her active service as the first hospital ship for the U.S. Navy.

Clara Barton recoiled at the waste of life, "If I were to speak of war, it would not be to show the glories of conquering armies but the mischief and misery they strew in their tracks . . . this is the side which history never shows." The National Museum of Civil War Medicine is dedicated to telling this history.

The unique Dr. Gordon E. Dammann medical collection is the core of the Museum's holdings. It features over 3,000 Civil War medical artifacts including the only known surviving surgeon's tent, examples of Dr. E.R. Squibb's traveling medical chests, uniforms, stretchers, medical and dental instruments, swords, books, documents, and personal effects. Many items tell a story about a caregiver or recipient of care. Using artifacts drawn from this collection, exhibits show how the casualties were cared for. Of note is a four-wheeled ambulance wagon on display in the recreated field hospital and a Civil War era holding coffin.

Frederick, MD, offers a strategic location for the Museum. It is centrally located within a 30-minute drive to five major Civil War battlefields: Gettysburg, Antietam, South Mountain, Harper's Ferry, and Monocacy. The close proximity to battlefields caused Frederick to become a major hospital center during the Civil War. Twenty-nine known sites in Frederick were used as hospitals after the battles of South Mountain and Antietam. They were organized into seven official general hospitals, two hospital camps, and four unofficial sites associated with one of the general hospitals. In addition, numerous private homes took in injured military officers. Many of these buildings are still standing—two are directly across the street from the Museum. About 6,000 patients were brought to Frederick after the battle of Antietam alone.

The pre-Civil War building that houses the NMCWM was used as a station to embalm the dead from these battles. An undertaking business operated in the building from 1832 to 1932. The Museum, however, is still a work in progress with displays confined to the first floor at this time. The three-story historic structure will be totally renovated beginning in April 1999 thanks to a 1 million dollar private donation and a 1 million dollar state matching grant for that purpose. The provisions of the state grant will ensure all restoration work is accomplished in accordance with the Secretary of the Interior's Guidelines for Historic Preservation.

In addition to its exhibits and an impressive array of special events, the Museum offers an annual 3-day conference on Civil War medicine the first weekend each August. The keynote speaker for the 1998 conference was LGEN Ronald R. Blanck, Surgeon General of the Army. In August 1997, an educational partnership agreement between the Army Medical Research and Materiel Command, Fort Detrick, MD, and the NMCWM was formally signed. This agreement allows the two bodies to develop outreach tours and lectures for the Army, create cooperative exhibits about the past, present, and future of military medicine and share resources. The Museum would like to have a similar partnership with the Navy in the near future.

The NMCWM is devoted to telling the medical part of the drama of the Civil War. It is a story of care and healing, courage and devotion amidst death and destruction. It is a story of major advances that changed medicine forever and of thousands of men and women who risked everything to make a terrible situation better. Through dedication, innovation, and sheer stubbornness from Civil War physicians and medical support staff on both sides of the conflict, the foundation was laid for today's modern military medicine. Their tenacity and compassion to heal stemmed a casualty rate that could have easily been twice the 620,000. Every soldier, sailor, and airman wounded since the Civil War including those in Desert Storm and Bosnia owe their high-quality medical care to the fundamental principles and techniques began by the Civil War medical corps.

The National Museum of Civil War Medicine, 48 East Patrick Street, P.O. Box 470, Frederick, MD, is open 7 days a week, Monday-Saturday 10:00 a.m.-5:00 p.m., and Sunday 11:00 a.m.-5:00 p.m. From mid-November to mid-March, the Museum closes at 4:00 p.m. Call for holiday hours. A small admission fee is charged. For more information visit our web site at www.CivilWarMed.org, e-mail Museum@CivilWarMed.org or call 301-695-1864.

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Ms. Moone is the Development Officer at the National Museum of Civil War Medicine, Frederick, MD. She was on active duty in the Air Force medical service for 9 years and was deployed to a 1,000-bed contingency hospital during the Persian Gulf War. She currently serves in the Air Force Reserve.

Above and Beyond:
Hospital Corpsman Receives Nation's Highest Honor

HMCS(FMF) Mark T. Hacala, USNR

HM3 Robert Ingram endured the horrors of war on a Monday afternoon, 28 Mar 1966. That day, enemy soldiers shot the 20-year-old four times in a vicious battle in Vietnam. He almost did not survive the day. On 10 July 1998, a Friday afternoon 32 years later, Ingram received the Medal of Honor for his heroism.

Ingram's award is a fitting symbol of the nation's gratitude and respect. Perhaps more inspiring is the tribute paid by Ingram's own Marines, who ensured that their hospital corpsman's courage was recognized.

The nomination for the Medal of Honor had slipped through the cracks. At a reunion in 1995, Ingram's former platoon commander, Jim Fulkerson, discovered that he had not received any decoration for the March 1966 battle. No trace of the original nomination remained, so the survivors of the engagement took action and recreated the package. After 2 years of interaction with the Marine Corps and the Navy, the award was approved.

Little did Ingram realize when he joined the Navy in 1963 that he would one day stand in the White House to receive the nation's highest decoration for gallantry.

A Change of Rating

Bob Ingram had no interest in a medical career when he enlisted in the Navy. The Clearwater, FL, native had signed to become an aviation electronics technician. While in boot camp, though, he became ill with pneumonia and spent several days on a busy ward. It was there that he first saw Navy hospital corpsmen. "It was immediately obvious that the type of job they did could mean the difference between life or death," Ingram recalls. "I had never seen anyone who put that much into their job before. I wanted some of that." As soon as he returned to his company, Ingram requested a change in rating.

In Hospital Corps School, San Diego, CA, Ingram worked to finish in the top 10 of his class, certain he would earn a seat in surgical technician school. Much to his chagrin, he received orders to Field Medical Service School at Camp Pendleton, CA.

Ingram was unaware of the Navy Medical Department's support of the Marines, and was unhappy with this turn of events. "The training was good and I am sure it sank in," Ingram recalls. "What I saw myself doing for the next 3 1/2 years was standing around in the field with a bunch of Marines waiting to put bandages on them. I don't think I ever really considered that I would go into combat."

Ingram remained at Camp Pendleton with his orders to 1st Battalion, 7th Marines, 1st Marine Division. He spent some 8 months with B Company, where he made friends, but did not function well. When Ingram demanded reassignment, the battalion aid station complied by sending him to "the gungiest company on the base."

"Suicide Charley"

"When I got into Charlie Company," Ingram says, "it was a totally different situation." C Company, 1/7 Marines had a reputation for being rock-hard. The unit spent most of its time in the field, took on the most difficult training assignments, and pushed itself harder than perhaps any rifle company in 1st Marine Division. Its attitude was reflected in the nickname it had earned on Guadalcanal in World War II—"Suicide Charley."

"When I walked through the front door of Charlie Company, the first man I checked in with was the commanding officer. I found that very unusual," Ingram recalls. "He treated me with

Photo courtesy Robert Ingram

HM3 Robert Ingram receives the Purple Heart.

respect and obviously demanded respect. Everything from that point on, right on down to the lowest rated man, was pure respect. I was at home when I found Charlie Company," Ingram says.

He flourished in his new unit. The young hospital corpsman learned to fire all the Marines' weapons and rapidly mastered the arts of an infantryman and a field hospital corpsman. His motivation earned HM3 Ingram the respect of the Marines in Charlie 1/7. According to Ben Goodwyn, Ingram's company commander, "He was very oriented to the men, and very concerned with their welfare. That's what made him outstanding." Jim Fulkerson, Ingram's platoon commander, concurred. "He was a fantastic corpsman. His Marines always had a great amount of confidence in him."

The 1st Battalion, 7th Marines deployed to Okinawa, Japan, in May 1965 for training exercises. In a matter of weeks, however, the unit was headed for a virtually unknown hotspot in Southeast Asia.

Vietnam

Large-scale commitment of U.S. personnel had begun only months before Ingram arrived in Vietnam in July 1965. The 1st Battalion, 7th Marines moved into the bush and soon participated in combat operations, outpost duty, and long patrols in search of the enemy.

With a shortage of hospital corpsmen, Ingram often did as many as 20 patrols a week. "What a lot of people don't realize is that Doc Ingram did twice as many patrols as the Marines did," says company commander Ben Goodwyn. The effect on the young hospital corpsman was dramatic. Within 6 months, Ingram lost 60 pounds.

Ingram was reliable under fire. On 8 Feb 1966, overwhelming numbers of North Vietnamese soldiers ambushed a Charlie Company patrol in one of the unit's fiercest engagements. In the chaos that ensued, HM3 Ingram moved forward to reach two wounded comrades. The fire was so intense that enemy bullets pierced both his canteens. When the Marines' machine gunner was hit, the beleaguered patrol's greatest protective asset was down. Realizing this, Ingram rushed forward through a hail of enemy fire to man the gun and aid in the platoon's defense. His heroism on that day earned him the Silver Star.

After several months in Vietnam, C Company 1/7 was down to 114 men, half its original strength. And their costliest battle was yet to come.

Above and Beyond the Call of Duty

Operation Indiana was planned as a search and destroy action against enemy forces in the Son Tinh District of Quang Ngai Province. On 28 Mar 1966 the companies of 1st Battalion, 7th Marines were to land at a single site, and then move to positions from which they could assault and corner their adversaries. From the landing zone, C Company was to move north and then turn left to reach its blocking position. The other companies would then assault the enemy and push them into C Company, effectively forcing them into a wall of Marines.

C Company was dispersed over a half mile as it moved out from the landing zone. Negotiating the difficult terrain, they went too far north before turning westward. Ahead of them, the company spotted several soldiers in khaki uniforms and pith helmets with AK-47 rifles. These were not the guerrilla Viet Cong, but regular North Vietnamese troops, and they were far north of the village complex where they were guessed to be. The company reported its find to battalion and received permission to attack.

HM3 Ingram was with the lead elements of the company's Third Platoon as it quickly dispatched the outpost and moved forward. But the shots had alerted the enemy's main force that the Marines were coming. Facing the Marines were several hundred North Vietnamese soldiers armed with rifles, mortars, and machine guns. Worse yet, they had four 12.7 mm antiaircraft guns, whose exploding rounds would soon be aimed at the young Americans.

Third Platoon moved down a slope toward a rice paddy. "By that time we were already on the forward slope and, like Third Platoon was normally trained to do, we charged them," Ingram recounts. He and one of the sergeants took off to the left side of the ridge to flank the enemy. "We got around the back side of the hill and opened up on these two guys coming off the hill and as soon as we opened up, all hell broke

loose, to the tune of hundreds and hundreds of automatic weapons firing at us." Within seconds, every man in the lead squad was hit except for Ingram.

Seeing the platoon's point man, CPL Richard Mayes, dropped as he sought cover, Ingram moved in to treat the Marine. Ingram saw that Mayes was hit several times, and he turned the Marine's head to check his pupils. As he did so, an AK-47 round punctured the hospital corpsman's hand and continued through his patient's head. It was clear at that point that the Marine was "very dead."

Fire poured in on the two figures, and Ingram returned it. After collecting Mayes' ammo clips, the hospital corpsman moved on to his next patient. CPL Harvey Kappeler saw Ingram moving across the field when an enemy round went through the doc's knee joint. "He got back up dragging a leg as he reached another of our comrades," Kappeler wrote. Bullets continued to pepper the field, knocking so many leaves from the trees that it seemed like autumn. HM3 Ingram continued to expose himself to the gunfire to seek the wounded.

As he knelt to evaluate another patient, Ingram saw movement to his right. An enemy soldier emerged from a spider trap and fired his rifle, the round smashing into the right side of Ingram's face and coming out the other side. The impact spun Ingram around and knocked him to the ground. Although dazed, he realized he was still alive. He then saw his malefactor just yards away. Ingram leveled his M-14 and put two rounds through the North Vietnamese soldier's chest.

"My hearing was very impaired and my vision was pretty blurry. It was obvious that my skull was mush," says Ingram. "At that point you just make a decision: What are you gonna do? Keep on going."

Although slowed greatly by his wounds, Ingram continued to move

Photo by the author

Robert Ingram and Chief of Naval Operations ADM Jay Johnson at the Navy Memorial

across the field in search of other casualties. He eventually came across the company's other hospital corpsman, who was unconscious from a bullet that had grazed his skull. As he dragged his fellow Sailor to cover, an enemy machine gunner hit Ingram in the buttock and groin.

Even with four bullet wounds, Ingram moved on to find more patients. Finally, as darkness began to fall, he moved toward the rear. He was too weak to climb a 4-foot slope when 1st LT Goodwyn reached over, pulled him to safety, and sent him back with the other casualties.

Ingram was completely unrecognizable. Blood and gore covered him from his nose to his belt. Goodwyn, who knew all the men in his command, had to turn to his company gunnery sergeant and ask who it was. "That was Doc Ingram," the gunny replied.

Ingram does not remember, but is told that he attempted to delay his own medical evacuation from the field. He claimed he was "walking wounded."

The casualty receiving assets of the medical battalion were taxed that day. "We were laying there in the aid station. I do remember laying in a pile of men back at the back," Ingram recalls. He was surrounded by the Marines of Charlie Company, which sustained horrific losses. Out of its 114 men, 11 were killed and 53 wounded in the fight.

Ingram's painful recovery took 8 months. He was discharged in the spring of 1968 and moved back to Florida, where he enrolled in a nursing program. He completed the requirements to become a registered nurse in 1971. He now lives and works in Jacksonville, FL.

Ingram has said that everyone who took part in that battle showed as much tenacity and dedication as he did. His Marines respectfully disagree. Jim Fulkerson states that Ingram, "is the most humble, unassuming man I've ever met." Harvey Kappeler went even further. "I never saw such a display of courage and unselfishness as I did from Doc Ingram that day," he wrote. Such sentiments are universal among the survivors of "Suicide Charley." Twenty-five of the company's Marines came from across the country to be with their hospital corpsman when President Clinton awarded him the Medal of Honor.

> "Mr. Ingram is the 22nd Navy [hospital] corpsman to receive the Medal of Honor, and his reward comes appropriately as we celebrate the 100th anniversary of the Navy Hospital Corps. Through all our conflicts, they have been there on ships at sea, on the front lines, performing foxhole surgery, saving thousands of lives while risking and sometimes sacrificing their own. I salute their courageous service to our nation."—President Bill Clinton, 10 July 1998 ❑

HMCS(FMF) Hacala is currently assigned to the office of the Force Master Chief Petty Officer (MED-00HC), Bureau of Medicine and Surgery, Washington, DC.

Navy Medicine Research and Development Highlights

National Naval Medical Center, Bethesda, MD

●Cobra Gold 98 Diarrhea and Fever Study

Cobra Gold 98, the 17th in a series of annual joint-combined exercises between United States and Royal Thai Armed Forces, is one of the largest exercises involving U.S. forces in the Pacific Command. During the summer of 1998, over 10,000 personnel from the Navy, Marine Corps, Army, and Air Force participated in land and air operations, combined naval operations, amphibious operations, and special operations in Thailand. Historically, diarrhea, with and without fever, is a leading cause of illness, with food-borne Campylobacter causing 30 percent to 50 percent of reported cases (Campylobacter is also associated with large numbers of diarrhea cases among U.S. military personnel deployed to the Middle East and South America). Campylobacter has become increasingly resistant to commonly used antibiotics. During Cobra Gold 90, all Campylobacter isolates were sensitive to routine antibiotics, while in Cobra Gold 95, only 16 percent of Campylobacter isolates were sensitive to the same antibiotics. During the summer of 1998, an 18-member team of Navy and Army researchers and preventive medicine personnel, coordinated by the Naval Medical Research Institute, Bethesda, MD, completed a comprehensive, month-long study of diarrhea and associated fever among the exercise participants. During the course of the study, Campylobacter was detected in 15 percent of samples and was responsible for fewer cases of diarrhea than during Cobra Gold 90 (41 percent) or Cobra Gold 96 (34 percent). Although data analysis is ongoing, the clinical impression was that disease was less severe than previously observed. The reduced impact of diarrhea could be the result of a variety of influences including improved sanitation in the areas surrounding the exercise sites and aggressive preventive medicine practices among deployed personnel. It should be noted that Campylobacter attack rates in deployed troops have varied depending on the exercise, time of year, and geographic location. Future studies will be required to determine if these unanticipated observations of diarrhea attack rates and overall severity represent the beginning of a trend or are unique to Cobra Gold 98.

●NSMRL New Web Site

For over 50 years the Naval Submarine Medical Research Laboratory (NSMRL) has been a major supporter of the Navy's submarine and diving communities. Established during World War II to work with a growing submarine force, NSMRL conducted mission-critical studies in night vision, sonar sound discrimination, and personnel selection. Over the years NSMRL continued to serve the fleet by taking the lead in undersea human factors studies, sensory science programs, and operational medicine projects. Today the laboratory's mission is focused on research efforts to enhance auditory and visual operator performance, develop health and physical standards for submarine crews and Navy divers, conduct atmospheric monitoring of closed environments, refine escape and rescue procedures, and promote hearing conservation in the air and under the sea. A few examples of products under development include: (1) developing an active noise-reduction stethoscope for field and shipboard use which will improve treatment of casualties in a variety of high-noise settings, (2) developing a computerized expert system, SEAREX, to advise survivors trapped in a sunken submarine, (3) providing signal processing techniques to improve the auditory detection and recognition of sonar signals and communications, (4) determining the priority and organization of available information required by the Approach Officer of the New Attack Submarine in order to design a data base for an automated information retrieval decision-aid system, (5) protecting divers exposed to intense underwater sound, (6) creating an intelligent system to identify human factors guidelines and performance data that support emerging engineering design software for new ships' systems, (7) reducing trained manpower losses from submarine medical disqualification, and (8) improving submarine atmosphere monitoring techniques.

For more information on research efforts at NSMRL visit their new web site at http://www.nhrc.navy.mil/nsmrl.

Navy Medicine 1950

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U.S. Naval Hospital Newport, RI, contingent marches through downtown in the Armistice Day Parade.

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